Periodic Table Families/Group Characteristics Notes

Families Stick Together

http://www.chem4kids.com/files/elem_transmetal.html

We just covered the columns and rows of the periodic table. There are also other, less specific, groups of elements. These groups are all over the table. Scientists group these families of elements by their chemical properties. Each family reacts in a different way with the outside world. Metals behave differently than gases, and there are even different types of metals. Some elements don't react, while others are very reactive, and some are good conductors of electricity.

Halogens on the Right

https://www.youtube.com/watch?v=J7b2aBKa6-U

In the second column from the right side of the periodic table, you will find Group Seventeen (Group XVII). This column is the home of the halogen family of elements. Who is in this family? The elements included are fluorine (F), chlorine (Cl), bromine (Br), iodine (I), and astatine (At).

What Makes Them Similar?

When you look at our descriptions of the elements fluorine and chlorine, you will see that they both have seven electrons in their outer shell. That seven-electron trait applies to all of the halogens. They are all just one electron shy of having full shells. Because they are so close to being happy, they have the trait of combining with many different elements. They are very reactive. You will often find them bonding with metals and elements from Group One of the periodic table. The elements in the column on the left each have one electron that they like to donate.

We've just told you how reactive the halogens are. Not all halogens react with the same intensity or enthusiasm. Fluorine is the most reactive and combines with most elements from around the periodic table. Reactivity decreases as you move down the column. As you learn more about the table, you will find this pattern true for other families. As the atomic number increases, the atoms get bigger. Their chemical properties change just a little bit when compared to the element right above them on the table.

What is a Halide?

The elements we are talking about in this section are called halogens. When a halogen combines with another element, the resulting compound is called a halide. One of the best examples of a halide is sodium chloride (NaCl). Don't think that the halogens always make ionic compounds and salts. Some halides of the world are a part of molecules with covalent bonds.

The Noble Gases

https://www.youtube.com/watch?v=qNaBMvJXdJ4

We love the noble gases. Some scientists used to call them the inert gases. It didn't really work because there are a few other gases that are basically inert but not noble gases. Nitrogen (N_2) might be considered an inert gas, but it is not a noble gas. The noble gases are another family of elements, and all of them are located in the far right column of the periodic table. For all of you budding chemists, the far right is also known as Group Zero (Group 0) or Group Eighteen (Group XVIII). This family has the happiest elements of all.

Why Are They Happy?

Using the Bohr description of electron shells, happy atoms have full shells. All of the noble gases have full outer shells with eight electrons. Oh, wait! That's not

totally correct. At the top of the noble gases is little helium (He), with a shell that is full with only two electrons. The fact that their outer shells are full means they are quite happy and don't need to react with other elements. In fact, they rarely combine with other elements. That non-reactivity is why they are called inert.

Who's in the Family?

All of the elements in Group Zero are noble gases. The list includes helium, neon (Ne), argon (Ar), krypton (Kr), xenon (Xe), and radon (Rn). Don't think that, because these elements don't like to react, we don't use them. You will find noble gases all over our world. Neon is used in advertising signs. Argon is used in light bulbs. Helium is used in balloons and to cool things. Xenon is used in headlights for new cars. Because of their chemical properties, these gases are also used in the laboratory to help stabilize reactions that would usually proceed too quickly. When you move down the periodic table, as the atomic numbers increase, the elements become rarer. They are not just rare in nature, but rare as useful elements, too.

But Wait, They Do Bond!

Some do. As of about 40 years ago, scientists have been able to make some compounds with noble gases. Some have been used in compounds to make explosives, and others just form compounds in a lab. The thing to remember is that they were forced. When going about their natural lives, you will never (well, never say never, because there may be an exception) find the noble gases bonded to other elements.

. Alloys: Metals are easily combined. Mixtures of many metallic elements are called alloys. Examples of alloys are steel and bronze.

Alkali Metals to the Left

https://www.youtube.com/watch?v=JAPWCJEo9Iw

Let's go to the left side of the periodic table. When looking for families, the first one you will find is the alkali metal family of elements. They are also known as the alkaline metals. You should remember that there is a separate group called the alkaline earth metals in Group Two. They are a very different family, even though they have a similar name. That far left column is Group One (Group I). When we talk about the groups of the periodic table, scientists use Roman numerals when they write them out. The "one" in this case refers to having one electron in the outermost orbital.

A Family Portrait

Who's in the family? Starting at the top we find hydrogen (H). But wait. That element is NOT in the family. When we told you about families, we said that they were groups of elements that react in similar ways. Hydrogen is a very special element of the periodic table and doesn't belong to any family. While hydrogen sits in Group I, it is NOT an alkali metal.

Family Bonding

Now that we've covered that exception, the members of the family include: lithium (Li), sodium (Na), potassium (K), rubidium (Rb), cesium (Cs) and francium (Fr). As with all families, these elements share traits. They are very reactive. Why? They all have one electrons in their outer shell. That's one electron away from being happy (full shells). When you are that close to having a full shell, you want to bond with other elements and lose that electron. An increased desire to bond means you are more reactive. In fact, when you put some of these pure elements in water (H_2O), they can cause huge explosions.

The alkali metals are also metals. That seems obvious from the name. Often, in chemistry, characteristics are assigned by the way elements look. You will find that the alkali group is shiny and light in weight. Their light weight and physical properties separate them from other metals. They are malleable (bendable) and sometimes soft enough to be cut with a dull knife. Alkali metals are not the type of metals you would use for coins or houses.

Heading to Group Two – Alkaline Earth Metals

https://www.youtube.com/watch?v=DFQPnHkQlZM

So we just covered the alkali metals in Group I. You will find the alkaline earth metals right next door in Group II. This is the second most reactive family of elements in the periodic table. Do you know why they are called alkaline? When these compounds are mixed in solutions, they are likely to form solutions with a pH greater than 7. Those higher pH levels means that they are defined as "basic" or "alkaline" solutions.

A Family Portrait

Who's in the family? The members of the alkaline earth metals include: beryllium (Be), magnesium (Mg), calcium (Ca), strontium (Sr), barium (Ba) and radium (Ra). As with all families, these elements share traits. While not as reactive as the alkali metals, this family knows how to make bonds very easily. Each of them has two electrons in their outer shell. They are ready to give up those two electrons in electrovalent/ionic bonds. Sometimes you will see them with two halogen atoms, as with beryllium fluoride (BeF_2), and sometimes they might form a double bond, as with calcium oxide (CaO). It's all about giving up those electrons to have a full outer shell.

As you get to the bottom of the list, you will find the radioactive radium. While radium is not found around your house anymore, it used to be an ingredient in glow-in-the-dark paints. It was originally mixed with zinc sulfide (ZnS). The other elements are found in many items, including fireworks, batteries, flashbulbs, and special alloys. The lighter alkaline earth metals, such as magnesium and calcium, are very important in animal and plant physiology. You all know that calcium helps build your bones. Magnesium can be found in chlorophyll molecules.